Claims

What is claimed is:

1. An electrolytic capacitor comprising an anode, cathode and an electrolyte, said electrolyte further comprising:

   about 35-60%, by weight water;

   about 10-55%, by weight organic solvent;

   about 0.05 to 30%, by weight, at least one acid selected from sulphuric acid, boric acid and phosphorus oxy acid.

2. An electrolytic capacitor according to claim 1 wherein said at least one acid comprises sulphuric acid and at least one acid selected from boric acid and phosphorus oxy acid.

3. An electrolytic capacitor according to claim 2 wherein said at least one acid comprises sulphuric acid, boric acid and phosphorus oxy acid.

4. An electrolytic capacitor according to claim 3 wherein said electrolytic solution comprises: about 0.05 to 10%, by weight, sulphuric acid;

   about 0.05 to 10%, by weight, boric acid; and

   about 0.05 to 10%, by weight, phosphorus oxy acid.

5. An electrolytic capacitor according to claim 1 wherein said solvent is selected from a group consisting of glycerol, 1,3-propane diol; 2-methyl-1,3-propane diol; propylene glycol; polyethylene glycol monomethyl ether; N-alkyl-2-pyrrolidone and diethylene glycol.

6. An electrolytic capacitor according to claim 5 wherein said solvent is glycerol.

7. An electrolytic capacitor according to claim 5 wherein said solvent is 1,3-propane diol.

8. An electrolytic capacitor according to claim 5 wherein said solvent is 2-methyl-1,3-

propane diol.

9. An electrolytic capacitor according to claim 5 wherein said solvent is propylene glycol .

10. An electrolytic capacitor according to claim 5 wherein said solvent is polyethylene glycol monomethyl ether.

11. An electrolytic capacitor according to claim 1 comprising about 35-55%, by weight, organic solvent.

12. An electrolytic capacitor according to claim 1 comprising about 40-60%, by weight, water.

13. An electrolytic capacitor according to claim 1 wherein said phosphorus oxy acid is orthophosphoric acid.

14. An electrolytic capacitor according to claim 1 wherein said phosphorus oxy acid is phosphorous acid.

15. An electrolytic capacitor according to claim 1 wherein said electrolyte has a pH below about 7.

16. An electrolytic capacitor according to claim 15 wherein said electrolyte has a pH below about 5.

17. An electrolytic capacitor according to claim 16 wherein said electrolyte has a pH below about 4.

18. An electrolytic capacitor according to claim 1 wherein said anode is tantalum.

19. An electrolytic capacitor according to claim 1 wherein said cathode is a conductive metal provided with a semiconductive or metal-like conductive coating.

20. An electrolytic capacitor according to claim 19 wherein said cathode is at least one element chosen from a group consisting of an oxide, a nitride, a carbide or a metal or an

activated carbon.

21. An electrolytic capacitor according to claim 20 wherein said cathode comprises a metal selected from a group consisting of tantalum, titanium, iridium, platinum, palladium, gold, silver, molybdenum, ruthenium, tungsten, zirconium, hafnium, rhodium, vanadium, osmium and niobium.

22. An electrolytic capacitor according to claim 21 wherein when said acid comprises sulphuric acid said cathode is a metal selected from a group consisting of tantalum, iridium, platinum, palladium, gold, silver, ruthenium, tungsten, rhodium, vanadium and osmium.

23. An electrolytic capacitor according to claim 19 wherein said cathode comprises a porous ruthenium oxide film provided on a tantalum substrate or a titanium substrate or an alloy thereof.

24. An electrolytic capacitor according to claim 1 wherein said electrolyte has a freezing point below about –30°C.

25. An electrolyte for activating a capacitor comprising:

about 35-60%, by weight water;

about 10-55%, by weight organic solvent;

about 0.05 to 30%, by weight, at least one acid selected from sulphuric, boric acid and phosphorus oxy acid.

26. An electrolyte according to claim 25 wherein said acid comprises sulphuric acid and at least one acid selected from boric acid and phosphorus oxy acid.

27. An electrolyte according to claim 26 wherein said acid comprises sulphuric acid, boric acid and phosphorus oxy acid.

28. An electrolyte according to claim 27 wherein said electrolytic solution comprises:

about 0.05 to 10%, by weight, sulphuric acid;

about 0.05 to 10%, by weight, boric acid; and

about 0.05 to 10%, by weight, phosphorus oxy acid.

29. An electrolyte according to claim 25 wherein said solvent is selected from a group consisting of glycerol, 1,3-propane diol; 2-methyl-1,3-propane diol; propylene glycol; polyethylene glycol monomethyl ether; N-alkyl-2-pyrrolidone and diethylene glycol.

30. An electrolyte according to claim 29 wherein said solvent is glycerol.

31. An electrolyte according to claim 25 wherein said solvent is 1,3-propane diol.

32. An electrolyte according to claim 31 wherein said solvent is 2-methyl-1,3-propane diol.

33. An electrolyte according to claim 25 wherein said solvent is propylene glycol.

34. An electrolyte according to claim 25 wherein said solvent is polyethylene glycol monomethyl ether.

35. An electrolyte according to claim 25 wherein said phosphorus oxy acid is orthophosphoric acid.

36. An electrolyte according to claim 25 wherein said phosphorus oxy acid is phosphorous acid.

37. An electrolyte according to claim 25 wherein said electrolyte has a pH of less than about 7.

38. An electrolyte according to claim 37 wherein said electrolyte has a pH of less than about 5.

39. An electrolyte according to claim 38 wherein said electrolyte has a pH of less than about 4.

40. An electrolyte according to claim 25 wherein said electrolyte has a freezing point below about

-30°C.

41. A capacitor comprising the electrolyte according to claim 25.

42. A method for providing a capacitor comprising the steps of:

providing a tantalum anode;

providing a cathode;

activating said anode and said cathode with an electrolyte comprising:

about 35-60%, by weight water;

about 10-55%, by weight organic solvent;

about 0.05 to 30%, by weight, at least one acid selected from sulphuric, boric acid and phosphorus oxy acid;

wherein said electrolyte has a pH below about 5 and a freezing point below about –30°C.

43. A method according to claim 42 wherein said acid comprises sulphuric acid and at least one acid selected from boric acid and phosphorus oxy acid.

44. A method according to claim 43 wherein said acid comprises sulphuric acid, boric acid and phosphorus oxy acid.

45. A method according to claim 44 wherein said electrolytic solution comprises: about 0.05 to 10%, by weight, sulphuric acid;

about 0.05 to 10%, by weight, boric acid; and

about 0.05 to 10%, by weight, phosphorus oxy acid.

46. A method according to claim 42 wherein said solvent is selected from a group consisting of glycerol, 1,3-propane diol; 2-methyl-1,3-propane diol; propylene glycol; polyethylene

glycol monomethyl ether; N-alkyl-2-pyrrolidone and diethylene glycol.

47. A method according to claim 46 wherein said solvent is glycerol.

48. A method according to claim 46 wherein said solvent is 1,3-propane diol.

49. A method according to claim 46 wherein said solvent is 2-methyl-1,3-propane diol.

50. A method according to claim 46 wherein said solvent is propylene glycol.

51. A method according to claim 46 wherein said solvent is polyethylene glycol monomethyl ether.

52. A method according to claim 42 wherein said phosphorus oxy acid is orthophosphoric acid.

53. A method according to claim 42 wherein said phosphorus oxy acid is phosphorous acid.

54. A method according to claim 46 wherein said cathode is a conductive metal provided with a semiconductive or metal-like conductive coating.

55. A method according to claim 54 wherein said cathode is at least one element chosen from a group consisting of an oxide, a nitride, a carbide of a metal or an activated carbon.

56. A method according to claim 55 wherein said cathode comprises a metal selected from a group consisting of tantalum, titanium, nickel, iridium, platinum, palladium, gold, silver, cobalt, molybdenum, ruthenium, manganese, tungsten, iron, zirconium, hafnium, rhodium, vanadium, osmium and niobium.

57. A method according to claim 56 wherein when said acid comprises sulphuric acid, sufficient buffering material is added to raise the pH to a level sufficient to avoid dissolution of components of manufacture of said capacitor.

58. A method according to claim 54 wherein said cathode comprises a porous ruthenium oxide film provided on a titanium substrate.

59. A method according to claim 42 wherein said electrolyte has a pH of less than about 4.

60. A capacitor prepared by the method according to claim 42.

61. An electrolytic capacitor comprising an anode, cathode and an electrolyte comprising:

about 35-60%, by weight water;

about 10-55%, by weight organic solvent;

about 0.05 to 30%, by weight, a mixture of ammonium acetate, boric acid, phosphorus oxy acid and acetic acid.

62. An electrolytic capacitor according to claim 61 wherein said electrolytic solution comprises: about 0.05 to 10%, by weight, ammonium acetate;

about 0.05 to 10%, by weight, boric acid;

about 0.05 to 10%, by weight, phosphorus oxy acid.

63. An electrolytic capacitor according to claim 61 wherein said solvent is selected from a group consisting of glycerol, 1,3-propane diol; 2-methyl-1,3-propane diol; propylene glycol; polyethylene glycol monomethyl ether; N-alkyl-2-pyrrolidone and diethylene glycol.

64. An electrolytic capacitor comprising an anode, cathode and an electrolyte comprising:

about 35-60%, by weight water;

about 10-55%, by weight organic solvent selected from a group consisting of glycerol, 1,3-propane diol; 2-methyl-1,3-propane diol; propylene glycol; polyethylene glycol monomethyl ether; N-alkyl-2-pyrrolidone and diethylene glycol;

about 0.05 to 30%, by weight, a mixture of ammonium acetate and acetic acid.